PATENT ABSTRACTS OF JAPAN

(11)Publication number : **08-177608**

(43)Date of publication of application : **12.07.1996**

(51)Int.CI. F02D 45/00

B60R 16/02

G01M 17/007

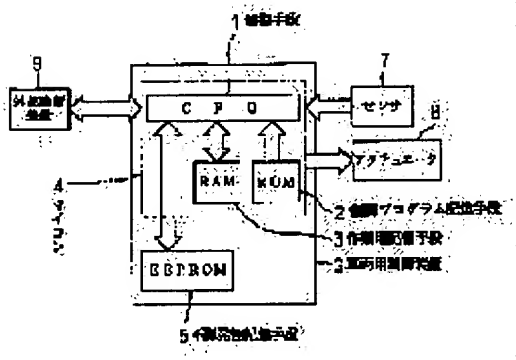
(21)Application number : **06-322760**

(22)Date of filing : **26.12.1994**

(71)Applicant : **NIPPONDENSO CO LTD**

(72)Inventor : **SAWAMOTO TETSUO**

(54) CONTROL SYSTEM FOR VEHICLE



(57)Abstract:

PURPOSE: To read out a program or a datum which is low in the frequency of use among the stored contents of a serial communication system nonvolatile memory means when a special condition is satisfied, and to transfer it to a work memory means.

CONSTITUTION: The memory area of a serial communication system EEPROM 5 arranged in ECU 6 for executing the engine control of an automobile is separately composed of the first area where a failure diagnosis program and judged value data are stored, in which the failure diagnosis program is usually executed after the start of an engine and the second area where a data outputting program is stored, which is used only in the case of an external diagnosis device 9 connected to ECU 6. CPU 1 first transfers the stored contents of the first area to RAM 3, and the stored contents of the second area are read out when the external diagnosis device 9 is connected to ECU 6 and transfered to RAM 3.

LEGAL STATUS

[Date of request for examination]	16.04.2001
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

CLAIMS

[Claim(s)]
[Claim 1] A control program storage means by which a control program is memorized, and a working-level month storage means by which a program or data is transmitted at the time of an activity, While performing the control program read from the non-volatile storage means and control program storage means of the serial communication method with which the auxiliary programs or data other than a control program are memorized The auxiliary program or data read from said non-volatile storage means is transmitted to said working-level month storage means. In the control unit for cars which possesses the control means which reads and performs an auxiliary program or data from a working-level month storage means henceforth if needed said non-volatile storage means The 1st area where the high auxiliary program or the data of operating frequency is memorized, It classifies and memorizes in the 2nd area where the low auxiliary program or the data of operating frequency is memorized. Said control means The control unit for cars characterized by transmitting the contents of storage of the 1st area to said working-level month storage means previously, and transmitting the contents of storage of the 2nd area to a working-level month storage means when special requirements are materialized.
[Claim 2] A control means is a control unit for cars according to claim 1 characterized by being constituted so that the termination of a transfer of the contents of storage of the 2nd area, interruption, or activation of the contents of storage may be chosen according to the contents of the processing command in special requirements.
[Claim 3] The auxiliary program or data memorized by the non-volatile storage means is a control unit for cars according to claim 1 or 2 characterized by being the program or data about troubleshooting of a car.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] When a program is read from a storage means at the time of program execution, this invention transmits the program to the working-level month storage means in which rapid access is possible, and relates to the control unit for cars which reads subsequent programs from a working-level month storage means, and performs them.
[0002]
[Description of the Prior Art] In the car, for example, an automobile, the engine control is performed by the control device containing a microcomputer, and the engine control program is

memorized by storage means, such as ROM.
[0003] Moreover, in an automobile, there is a thing with EEPROM used for the interior of a control unit as an auxiliary storage means. In order that this EEPROM may lessen the number of wiring, many things of the serial communication method which the address and data are synchronized with a clock signal, and transmits and receives them 1 bit at a time are used.
[0004]
[Problem(s) to be Solved by the Invention] By the way, in this way, when using the serial communication method EEPROM as an object for automobiles, it is assumed that the judgment data used for the electric fault finding about an engine or its troubleshooting are memorized. In this case, after a control program is read from the problem of the read time of EEPROM at the time of engine starting, from EEPROM, electric fault finding and judgment data are read serially, and are transmitted to RAM with a quick access speed. And the electric fault finding transmitted to RAM is read, a diagnosis of each part of an automobile is performed, and, as a result, it is displayed on the panel of a driver's seat by CPU of a microcomputer at the time of failure generating, and is reported to an operator.
[0005] It seems that moreover, the more detailed data of the troubleshooting result which the control unit performed may be displayed on external diagnostic equipment by connecting external diagnostic equipment to a control unit in troubleshooting of an automobile. Therefore, when external diagnostic equipment is connected to EEPROM, it is also assumed that the program for data output for outputting troubleshooting data is also memorized, and at the time of engine starting, with electric fault finding etc., these will also be read from EEPROM and will be transmitted to RAM.
[0006] However, EEPROM of a serial communication method transmits the address and 1 bit of data at a time by clock synchronization as mentioned above, and the read-out takes time amount very much to it. Moreover, the opportunity for external diagnostic equipment to be connected to a control device is the routine inspection time etc., and is rare, and reading the program for data output and data for it over [EEPROM] many hours each time, and transmitting to RAM had the fault to which it becomes an excessive processing burden and the processing time becomes long for the control device.
[0007] This invention solves the above-mentioned technical problem, the purpose is the contents of storage of a secondary memory means slack non-volatile storage means, and offering the control unit for cars controlled to carry out only when special requirements are materialized has the transfer to the working-level month storage means of the low auxiliary program or data of operating frequency.
[0008]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the control unit for cars according to claim 1 A control program storage means by which a control program is memorized, and a working-level month storage means by which a program or data is transmitted at the time of an activity, While performing the control program read from the non-volatile storage means and control program storage means of the serial communication method with which the auxiliary programs or data other than a control program are memorized In what transmitted the auxiliary program or data read from the non-volatile storage means to the working-level month storage means, and possesses the control means which reads and performs an auxiliary program or data from a working-level month storage means henceforth if needed The 1st area where, as for a non-volatile storage means, the high auxiliary program or the data of operating frequency is memorized, It classifies and memorizes in the 2nd area where the low

auxiliary program or the data of operating frequency is memorized. A control means When the contents of storage of the 1st area are previously transmitted to a working-level month storage means and special requirements are materialized, it is characterized by transmitting the contents of storage of the 2nd area to a working-level month storage means.
[0009] The control unit for cars according to claim 2 has the description at the place which constitutes a control means so that the termination of a transfer of the contents of storage of the 2nd area, interruption, or activation of the contents of storage may be chosen according to the contents of the processing command in special requirements.
[0010] In this case, the auxiliary program or data memorized by the non-volatile storage means is good to consider as the program or data about troubleshooting of a car (claim 3).
[0011]
[Function] According to the control unit for cars according to claim 1, since a control means transmits previously the contents of storage of the 1st area where operating frequency is higher than a non-volatile storage means to a working-level month storage means, and they are read when special requirements are materialized, and it transmits them to a working-level month storage means about the contents of storage of the 2nd area where operating frequency is low, unnecessary read-out and transfer processing are not performed.
[0012] According to the control unit for cars according to claim 2, even when special requirements are materialized, according to the contents of the processing command in the special requirement, the transfer to the working-level month storage means of the contents of storage of the 2nd area is stopped, or it is interrupted or the contents of storage of the 2nd area are performed.
[0013] In this case, from the exterior, about processing of troubleshooting, the contents of storage of the 2nd area used by the program about troubleshooting or the data, then the low frequency of a car are read, only when required, and the auxiliary program or data memorized by the non-volatile storage means is transmitted to a working-level month storage means (claim 3).
[0014]
[Example] This invention is explained with reference to a drawing below about one example at the time of applying to the troubleshooting processing in engine control of the automobile which is a car. In drawing 1 which shows the electric configuration of the part concerning this invention, CPU1 which is a control means is connected to RAM3 which is ROM2 and the working-level month storage means which are a control program storage means through the control signal line at the address and the data bus line list of parallel. The above constitutes the microcomputer (a microcomputer is called below) 4.
[0015] Moreover, there is EEPROM5 of the serial communication method which is a non-volatile storage means in the exterior of a microcomputer 4, and EEPROM5 is connected with CPU1 by serial bus through the serial interface which is not illustrated. And the engine control (ECU is only called hereafter) ECU 6 which controls the engine which is not illustrated as a control device for cars by the microcomputer 4 and EEPROM5 is constituted.
[0016] Moreover, it connects with CPU1 through the A/D converter which the sensor 7 containing a coolant temperature sensor, an intake temperature sensor, a throttle sensor, etc. does not illustrate, and the actuators 8, such as an injector and an idle speed control (ISC) bulb, are connected through the output circuit which is not illustrated. Furthermore, to ECU6 (CPU1), the external diagnostic equipment 9 is connectable by serial bus through the serial interface which is not illustrated, and CPU1 can be detected now with the detection signal with which the switch for connection detection which is not illustrated outputs whether whether special requirements'

being materialized and the external diagnostic equipment 9 are connected.
[0017] In drawing 2 which shows the address map of EEPROM5, it is the 1st area, for example, decision value data, such as opening / short decision value of the coolant temperature sensor as an auxiliary data, opening / short decision value of an intake temperature sensor, and an abnormality decision value in an ISC bulb, are stored the head of an address field to the first half. Moreover, although neither carries out illustration, diagnostic programs which perform troubleshooting using these decision value data, such as a coolant temperature sensor as an auxiliary program, an intake temperature sensor, and an ISC bulb, are also stored. The operating frequency of the diagnostic program and decision value data which are memorized in such 1st area used each time at the time of engine actuation is high.
[0018] It is the 2nd area after the 1st area, and the auxiliary program used since troubleshooting data are outputted to the external diagnostic equipment 9, for example, a coolant temperature sensor, the intake temperature sensor, the program for an ISC bulb diagnostic-data output, etc. are stored. The program for an output memorized in such 2nd area is used only when the external diagnostic equipment 9 is connected to ECU6, and the operating frequency is low.
[0019] Next, an operation of this example is explained also with reference to drawing 3 thru/or drawing 6 . In drawing 3 which shows the flow chart of the contents of control in the initialization processing after reset discharge, CPU1 clears first the contents of storage of the field used as a working area of RAM3 zero times in the processing step P1 of "RAM initialization." All the flags that are used by CPU1 in the processing mentioned later as for this zero clearance, setting in software are also reset. And it shifts to the processing step P2 of the next "EEPROM read-out address (N) initialization", and start-address N of the field currently assigned to EEPROM5 on the address map of CPU1 is initialized to an address counter.
[0020] And it will shift to the processing step P3 of an "EEPROM read in demand flag set", and if "1" is written in the field of an EEPROM read in demand flag prepared in RAM3 and the demand flag is set, it shifts to the processing step P4 of the next "interrupt release", and the interrupt-inhibit condition automatically set as the status register of CPU1 by the power up will be canceled, and it will shift to the following step which is not illustrated.
[0021] Then, CPU1 performs engine starting and an engine roll control for a control program in read-out and the main routine which is not illustrated from ROM2. Moreover, it is constituted so that timer interruption may go into CPU1 every 8ms with the timer which is not illustrated. Drawing 4 thru/or drawing 6 are the flow charts of the contents [in / in all / the timer interruption processing] of control.
[0022] In drawing 4 which shows the flow chart of the contents of control accompanying the connection condition of the external diagnostic equipment 9 in timer interruption processing, CPU1 judges first whether the external diagnostic equipment 9 is connected to ECU6 with reference to the detection signal of the connection detection switch which is not illustrated in the decision step Q1 of "external diagnostic-equipment connection ?." If the external diagnostic equipment 9 is not connected but it is judged as "NO" in the decision step Q1, it will shift to the processing shown in drawing 5 explained below. Moreover, if the external diagnostic equipment 9 is connected and it is judged as "YES" in the decision step Q1, it will shift to the following processing step Q2 of "transmitting a processing command Request-to-Send signal", and if a processing command Request-to-Send signal is transmitted to the external diagnostic equipment 9, it will shift to the processing shown in following drawing 5 .
[0023] In drawing 5 which shows the flow chart of the program execution partial processing (activation partial processing is only called hereafter) memorized by EEPROM5 in timer

interruption processing, it is first judged in the decision step R1 of "1st area read in completion flag =1?" whether the 1st area read in completion flag which shows read in completion of the 1st area of EEPROM5 is "1." In an initial state, since 0 ****** of all flags is carried out in step P1, it is judged as "NO", and it shifts to the processing shown in drawing 6 explained below.

[0024] In drawing 6 which shows the flow chart of read-out control-section processing (control-section processing is only called hereafter) of EEPROM5 in timer interruption processing, it is first judged in the processing step S1 of "EEPROM read in demand flag =1?" whether the EEPROM read in demand flag is set to "1." Here, since it is set to "1" in step P3, it is judged as "YES", and it shifts to the processing step S2 of the following "the address (N) to read-out", and is initialized in step P2, and the contents of storage of the start address of EEPROM5 (coolant temperature sensor opening / short decision value) which counted value N of an address counter shows are read through a serial bus. And it shifts to the processing step S3 of "transmitting to RAM."

[0025] In the processing step S3, the contents of storage of EEPROM5 read at step S2 are transmitted to the field to which it is assigned as a working area of RAM3. And it shifts to decision step S4 of "read in completion [of the 1st area] ?" of a degree, and the value and the counter value N which are set up as the last address of the 1st area of EEPROM5 are compared. At this time, by decision step S4, it is judged as "NO", and if it shifts to the processing step S5 of "N= N+1" and counted value N of an address counter is incremented, it will escape from timer interruption processing and it will carry out a return to the main routine which is not illustrated.

[0026] By [into which timer interruption goes / the processing shown in drawing 4 thru/or drawing 6 so far] being repeated every 8ms, the contents of storage of the 1st area of EEPROM5 are read from a head the single address every, and are transmitted to RAM3. And in step S5, the increment of the counted value N of an address counter is carried out, and it goes, and if it becomes equal to the value set up as the last address of the 1st area, in step S4, it will be judged as "YES", and will shift to the processing step S6 of the following "1st area read in completion flag set."

[0027] In the processing step S6, the 1st area read in completion flag which shows read in completion of the 1st area is set to "1", and it shifts to the decision step S7 of "read in completion [of the 2nd area] ?", and is compared with the value to which counted value N of an address counter is set as the last address of the 2nd area. At this time, at the decision step S7, it is judged as "NO", and if it shifts to the processing step S5 and counted value N of an address counter is incremented (counted value N becomes equal to the start address of the 2nd area at this time), it will escape from timer interruption processing and it will carry out a return to the main routine which is not illustrated.

[0028] Next, if timer interruption enters, since the read in completion flag of the 1st area is set to "1", it will be judged to be "YES" in step R1 of drawing 5 . And if it shifts to the decision step R2 of "external diagnostic-equipment connection ?", it will be judged whether the external diagnostic equipment 9 is connected to ECU6 (are special requirements materialized or not?). Here, supposing the external diagnostic equipment 9 is connected, in the decision step R2, it will be judged as "YES", and it will be judged whether it shifted to the decision step R3 of "processing command receiving [from external diagnostic equipment] ?" of a degree, and the processing command was received from the external diagnostic equipment 9.

[0029] In the decision step R3, if a processing command is not received from the external diagnostic equipment 9 but it is judged as "NO", it will escape from the activation partial processing shown in drawing 5 , and will shift to the control-section processing shown in

drawing 6 . In the decision step R3, if the processing command is received from the external diagnostic equipment 9 and it is judged as "YES", it will shift to the following decision step R4 of "whether a processing command is 1", and the contents of the processing command from the external diagnostic equipment 9 will judge "1" and no ("0"). In this case, the contents "1" of the processing command show the activation need for the contents of storage of the 2nd area, and the contents "0" show activation needlessness conversely. If it is judged as "YES" at this decision step R4, it will be judged whether the 2nd area read in completion flag which shifts to the decision step R5 of "2nd area read in completion flag =1?" of a degree, and shows read in completion of the 2nd area of EEPROM5 is set to "1." At this time, since the 2nd area of EEPROM5 is not read yet, it is judged to be "NO" in the decision step R5, escapes from the activation partial processing shown in drawing 5 , and shifts to the control-section processing shown in drawing 6 .

[0030] And in step S2 of drawing 6 , the contents of storage of the start address of the 2nd area of EEPROM5 which counted value N of an address counter shows at this time (head part of a coolant temperature sensor diagnostic-data output program) are read. And in the following step S3, the contents of storage are transmitted to RAM3 like the case of the 1st area.

[0031] In the following step S4, since it has completed, the read in of the 1st area judges it as "YES", and it repeats flag set actuation at step S6. In the following step S7, since it is judged as "NO" at this time, if counted value N is incremented at step S5, it will shift to the main routine which does not escape from and illustrate timer interruption processing.

[0032] By repeating the processing so far every 8ms containing timer interruption henceforth, like the case of the 1st area mentioned above, the contents of storage of the 2nd area of EEPROM5 are read from a head the single address every, and are transmitted to RAM3. And the increment of the counted value N is carried out in step S5, and it goes, and if it becomes equal to the value set up as the last address of the 2nd area, in step S7, it will be judged as "YES", and will shift to the processing step S8 of the following "2nd area read in completion flag set."

[0033] In the processing step S8, if the 2nd area read in completion flag which shows read in completion of the 2nd area is set to "1", it will shift to processing step S9 of the next "EEPROM read in demand flag reset", and if the EEPROM read in demand flag set to "1" in step P3 is set to "0" and reset, it will escape from timer interruption processing and a return will be carried out to a main routine. In the processing at the time of the timer interruption after this time, in order to judge it as "NO" in step S1, the control-section processing shown in drawing 6 after it escapes from and carries out the return of the interruption handling routine, without being carried out.

[0034] And in the next timer interruption processing, since the read in completion flag of the 2nd area is set, if it is judged as "YES" in step R4 of drawing 5 and shifts to step R5, it will be judged as "YES" here and will shift to the processing step R6 of the following "processing activation of the 1st and 2nd area."

[0035] In the processing step R6, the electric fault finding and decision value data of the 1st area of EEPROM5 which were transmitted to RAM3 are read, and the diagnostic program is performed to the sensors 7, such as a coolant temperature sensor and an intake temperature sensor, and the actuators 8, such as an ISC bulb. And while the diagnostic data which it is as a result of [the] activation is written in RAM3 and memorized, when abnormalities are in the diagnosed part, it makes the display lamp of a panel turn on and reports abnormalities to an operator.

[0036] After troubleshooting by the diagnostic program is completed next, the diagnostic-data output program of the 2nd area of EEPROM5 transmitted to RAM3 is read, the diagnostic data

memorized by RAM3 is read according to the output program, and it is outputted through a serial bus to the external diagnostic equipment 9. Then, activation partial processing of drawing 5 is ended. And the external diagnostic equipment 9 will be displayed on the display which does not illustrate the diagnostic data if a diagnostic data is given from ECU6.

[0037] Moreover, when it shifted to step R2, and the external diagnostic equipment 9 is not connected but it is judged as "NO" in step R2 after the 1st area read in completion flag was set It is not necessary to transmit a diagnostic data to the external diagnostic equipment 9, and it is judged that there is no read-out demand of the output program memorized in the 2nd area of EEPROM5. It shifts to the processing step R7 of the next "EEPROM read in demand flag reset", and an EEPROM read in demand flag is reset by "0" here. Therefore, since read-out control processing of drawing 6 is judged to be "NO" at step S1 and it escapes from processing immediately after this, read-out of the 2nd area of EEPROM5 is not performed. And if it shifts to the processing step R8 of the following "processing activation of the 1st area" and activation of the diagnostic program of the 1st area of EEPROM5 is performed like step R6, activation partial processing of drawing 5 will be ended.

[0038] Furthermore, when it shifted to step R3 and the processing command from the external diagnostic equipment 9 is not received after the 1st area read in completion flag was set, even if it judges it as "NO" at step R3 and the transfer to RAM3 of the contents of storage of the 2nd area is completed, it does not shift to step R4. Of course, after that, when a processing command is received from the external diagnostic equipment 9, it is judged as "YES" at step R3, and shifts to step R4. And when it is judged as "YES" at step R4, it shifts to steps R5 and R6.

[0039] However, when it is judged as "NO" at step R4, even if it has completed, the transfer to RAM3 of the contents of storage of the 2nd area is judged that the activation is unnecessary, and comes to shift to step R7.

[0040] The storage area of EEPROM5 which was arranged as mentioned above to the ECU6 interior which performs engine control of an automobile according to this example The 1st area which made the decision value data used for the electric fault finding usually performed after engine starting, or its program memorize, When the external diagnostic equipment 9 is connected to ECU6, it classifies and constitutes in the 2nd area which made the program for a diagnostic-data output for transmitting a diagnostic data to the external diagnostic equipment 9 memorize. CPU1 transmits the contents of storage of the 1st area to RAM3 previously, when the external diagnostic equipment 9 is connected, it transmits the contents of storage of the 2nd area to RAM3, and when not connecting, it does not perform the transfer to RAM3 -- it constituted like (it stops).

[0041] Therefore, since unlike the former read-out processing of the 2nd area of unnecessary EEPROM5 cannot be performed and the burden of read-out processing of CPU1 can be mitigated when the external diagnostic equipment 9 is not connected, the processing time can be shortened and it is also possible to assign the part of the mitigated burden to other effective processings.

[0042] moreover, when the external diagnostic equipment 9 is connected to CPU1 and a processing command is not transmitted from the external diagnostic equipment 9 If a transfer of the contents of storage of the 1st area is completed to RAM3, a transfer of the contents of storage of the 2nd area to RAM3 will come to be started succeedingly, but activation is not carried out even if a transfer of the contents of storage of this 2nd area is completed. And the contents of storage of the 1st area and the 2nd area which CPU1 received the processing command from the external diagnostic equipment 9, and were transmitted to RAM3 when the contents of the

processing command were activation need are performed.
[0043] Therefore, activation of the contents of storage of the 1st area and the 2nd area which were transmitted to RAM3 can be made to perform at the time of a request. And even if the contents of storage of the 2nd area are transmitting to RAM3, the transfer can be interrupted by making the contents of the processing command of the external diagnostic equipment 9 into activation needlessness.
[0044] This invention is not limited only to the example which described above and was indicated on the drawing, and the following deformation is possible for it. Although related with troubleshooting, the data or the program which EEPROM5 is made to memorize In EEPROM used for the code collating unit which collates whether the password code which a car antitheft device is sufficient as as long as it is related not only with this but with a car, and is memorized in the key is regular Usually, the 1st password code collated with the password code memorized in the key used well is memorized in the 1st area of EEPROM. It is used in case actuation of the code collating unit itself is inspected, and there is also an example which memorizes the 2nd password code collated with the specific password code inputted from the external device in the 2nd area. What is necessary is to make EEPROM memorize as the 1st area what has high operating frequency in short, and to make what has low operating frequency memorize as the 2nd area, and just to control not to perform read-out, if it judges that there is no read-out demand about the 2nd area (special requirements are not materialized).
[0045] Although the timer interruption period was set to 8ms, the period may be made for a long time or shorter than this. Moreover, processing at a high speed is also possible by making it perform by interruption of the short period of 2ms, only concerning the read-out control processing of EEPROM5 shown in drawing 6 . Furthermore, at the time of one interrupt processing, loop-formation processing may constitute the read-out control processing of EEPROM5 shown in drawing 6 so that the transfer to read-out and RAM3 of a multiaddress may be performed.
[0046] When the processing shown in each drawing of drawing 4 , drawing 5 , and drawing 6 as a series of timer interruption processings is constituted as one program module, respectively, the processing sequence of each of that module in timer interruption processing can be changed not only into the sequence of drawing 4 , drawing 5 , and drawing 6 but into arbitration. It can change [example / 2nd] similarly about drawing 9, drawing 10, and drawing 6 . Moreover, an object cannot be restricted to an automobile and it can apply suitably to a general car.
[0047]
[Effect of the Invention] Since this invention is as having explained above, the following effectiveness is done so. According to the control unit for cars according to claim 1, since the contents of storage of the 1st area where operating frequency is higher than a non-volatile storage means are previously transmitted to a working-level month storage means, and it reads when special requirements are materialized, and it transmits to a working-level month storage means about the contents of storage of the 2nd area where operating frequency is low, a control means cannot perform unnecessary read-out and transfer processing, and can mitigate the burden of processing.
[0048] According to the control unit for cars according to claim 2, according to the contents of the processing command in special requirements, a transfer of the contents of storage of the 2nd area to a working-level month storage means can be stopped from a non-volatile storage means, and it can perform alternatively performing the contents of storage of the 2nd area which was interrupted or was transmitted.

[0049] In this case, from the exterior, about processing of troubleshooting, the contents of storage of the 2nd area used by the program about troubleshooting or the data, then the low frequency of a car are read, only when required, and the auxiliary program or data memorized by the non-volatile storage means is transmitted to a working-level month storage means (claim 3).

TECHNICAL FIELD

[Industrial Application] When a program is read from a storage means at the time of program execution, this invention transmits the program to the working-level month storage means in which rapid access is possible, and relates to the control unit for cars which reads subsequent programs from a working-level month storage means, and performs them.

PRIOR ART

[Description of the Prior Art] In the car, for example, an automobile, the engine control is performed by the control device containing a microcomputer, and the engine control program is memorized by storage means, such as ROM.
[0003] Moreover, in an automobile, there is a thing with EEPROM used for the interior of a control unit as an auxiliary storage means. In order that this EEPROM may lessen the number of wiring, many things of the serial communication method which the address and data are synchronized with a clock signal, and transmits and receives them 1 bit at a time are used.

EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention is as having explained above, the following effectiveness is done so. According to the control unit for cars according to claim 1, since the contents of storage of the 1st area where operating frequency is higher than a non-volatile storage means are previously transmitted to a working-level month storage means, and it reads when special requirements are materialized, and it transmits to a working-level month storage means about the contents of storage of the 2nd area where operating frequency is low, a control means cannot perform unnecessary read-out and transfer processing, and can mitigate the burden of processing.
[0048] According to the control unit for cars according to claim 2, according to the contents of the processing command in special requirements, a transfer of the contents of storage of the 2nd area to a working-level month storage means can be stopped from a non-volatile storage means, and it can perform alternatively performing the contents of storage of the 2nd area which was interrupted or was transmitted.
[0049] In this case, from the exterior, about processing of troubleshooting, the contents of storage of the 2nd area used by the program about troubleshooting or the data, then the low frequency of a car are read, only when required, and the auxiliary program or data memorized by the non-volatile storage means is transmitted to a working-level month storage means (claim 3).

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, in this way, when using the serial communication method EEPROM as an object for automobiles, it is assumed that the judgment data used for the electric fault finding about an engine or its troubleshooting are memorized. In this case, after a control program is read from the problem of the read time of EEPROM at the time of engine starting, from EEPROM, electric fault finding and judgment data are read serially, and are transmitted to RAM with a quick access speed. And the electric fault finding transmitted to RAM is read, a diagnosis of each part of an automobile is performed, and, as a result, it is displayed on the panel of a driver's seat by CPU of a microcomputer at the time of failure generating, and is reported to an operator.

[0005] It seems that moreover, the more detailed data of the troubleshooting result which the control unit performed may be displayed on external diagnostic equipment by connecting external diagnostic equipment to a control unit in troubleshooting of an automobile. Therefore, when external diagnostic equipment is connected to EEPROM, it is also assumed that the program for data output for outputting troubleshooting data is also memorized, and at the time of engine starting, with electric fault finding etc., these will also be read from EEPROM and will be transmitted to RAM.

[0006] However, EEPROM of a serial communication method transmits the address and 1 bit of data at a time by clock synchronization as mentioned above, and the read-out takes time amount very much to it. Moreover, the opportunity for external diagnostic equipment to be connected to a control device is the routine inspection time etc., and is rare, and reading the program for data output and data for it over [EEPROM] many hours each time, and transmitting to RAM had the fault to which it becomes an excessive processing burden and the processing time becomes long for the control device.

[0007] This invention solves the above-mentioned technical problem, the purpose is the contents of storage of a secondary memory means slack non-volatile storage means, and offering the control unit for cars controlled to carry out only when special requirements are materialized has the transfer to the working-level month storage means of the low auxiliary program or data of operating frequency.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the control unit for cars according to claim 1 A control program storage means by which a control program is memorized, and a working-level month storage means by which a program or data is transmitted at the time of an activity, While performing the control program read from the non-volatile storage means and control program storage means of the serial communication method with which the auxiliary programs or data other than a control program are memorized In what transmitted the auxiliary program or data read from the non-volatile storage means to the working-level month storage means, and possesses the control means which reads and performs an auxiliary program or data from a working-level month storage means henceforth if needed The 1st area where, as for a non-volatile storage means, the high auxiliary program or the data of

operating frequency is memorized, It classifies and memorizes in the 2nd area where the low auxiliary program or the data of operating frequency is memorized. A control means When the contents of storage of the 1st area are previously transmitted to a working-level month storage means and special requirements are materialized, it is characterized by transmitting the contents of storage of the 2nd area to a working-level month storage means.
[0009] The control unit for cars according to claim 2 has the description at the place which constitutes a control means so that the termination of a transfer of the contents of storage of the 2nd area, interruption, or activation of the contents of storage may be chosen according to the contents of the processing command in special requirements.
[0010] In this case, the auxiliary program or data memorized by the non-volatile storage means is good to consider as the program or data about troubleshooting of a car (claim 3).

OPERATION

[Function] According to the control unit for cars according to claim 1, since a control means transmits previously the contents of storage of the 1st area where operating frequency is higher than a non-volatile storage means to a working-level month storage means, and they are read when special requirements are materialized, and it transmits them to a working-level month storage means about the contents of storage of the 2nd area where operating frequency is low, unnecessary read-out and transfer processing are not performed.
[0012] According to the control unit for cars according to claim 2, even when special requirements are materialized, according to the contents of the processing command in the special requirement, the transfer to the working-level month storage means of the contents of storage of the 2nd area is stopped, or it is interrupted or the contents of storage of the 2nd area are performed.
[0013] In this case, from the exterior, about processing of troubleshooting, the contents of storage of the 2nd area used by the program about troubleshooting or the data, then the low frequency of a car are read, only when required, and the auxiliary program or data memorized by the non-volatile storage means is transmitted to a working-level month storage means (claim 3).

EXAMPLE

[Example] This invention is explained with reference to a drawing below about one example at the time of applying to the troubleshooting processing in engine control of the automobile which is a car. In drawing 1 which shows the electric configuration of the part concerning this invention, CPU1 which is a control means is connected to RAM3 which is ROM2 and the working-level month storage means which are a control program storage means through the control signal line at the address and the data bus line list of parallel. The above constitutes the microcomputer (a microcomputer is called below) 4.
[0015] Moreover, there is EEPROM5 of the serial communication method which is a non-volatile storage means in the exterior of a microcomputer 4, and EEPROM5 is connected with CPU1 by serial bus through the serial interface which is not illustrated. And the engine control (ECU is only called hereafter) ECU 6 which controls the engine which is not illustrated as a

control device for cars by the microcomputer 4 and EEPROM5 is constituted.
[0016] Moreover, it connects with CPU1 through the A/D converter which the sensor 7 containing a coolant temperature sensor, an intake temperature sensor, a throttle sensor, etc. does not illustrate, and the actuators 8, such as an injector and an idle speed control (ISC) bulb, are connected through the output circuit which is not illustrated. Furthermore, to ECU6 (CPU1), the external diagnostic equipment 9 is connectable by serial bus through the serial interface which is not illustrated, and CPU1 can be detected now with the detection signal with which the switch for connection detection which is not illustrated outputs whether whether special requirements' being materialized and the external diagnostic equipment 9 are connected.
[0017] In drawing 2 which shows the address map of EEPROM5, it is the 1st area, for example, decision value data, such as opening / short decision value of the coolant temperature sensor as an auxiliary data, opening / short decision value of an intake temperature sensor, and an abnormality decision value in an ISC bulb, are stored the head of an address field to the first half. Moreover, although neither carries out illustration, diagnostic programs which perform troubleshooting using these decision value data, such as a coolant temperature sensor as an auxiliary program, an intake temperature sensor, and an ISC bulb, are also stored. The operating frequency of the diagnostic program and decision value data which are memorized in such 1st area used each time at the time of engine actuation is high.
[0018] It is the 2nd area after the 1st area, and the auxiliary program used since troubleshooting data are outputted to the external diagnostic equipment 9, for example, a coolant temperature sensor, the intake temperature sensor, the program for an ISC bulb diagnostic-data output, etc. are stored. The program for an output memorized in such 2nd area is used only when the external diagnostic equipment 9 is connected to ECU6, and the operating frequency is low.
[0019] Next, an operation of this example is explained also with reference to drawing 3 thru/or drawing 6 . In drawing 3 which shows the flow chart of the contents of control in the initialization processing after reset discharge, CPU1 clears first the contents of storage of the field used as a working area of RAM3 zero times in the processing step P1 of "RAM initialization." All the flags that are used by CPU1 in the processing mentioned later as for this zero clearance, setting in software are also reset. And it shifts to the processing step P2 of the next "EEPROM read-out address (N) initialization", and start-address N of the field currently assigned to EEPROM5 on the address map of CPU1 is initialized to an address counter.
[0020] And it will shift to the processing step P3 of an "EEPROM read in demand flag set", and if "1" is written in the field of an EEPROM read in demand flag prepared in RAM3 and the demand flag is set, it shifts to the processing step P4 of the next "interrupt release", and the interrupt-inhibit condition automatically set as the status register of CPU1 by the power up will be canceled, and it will shift to the following step which is not illustrated.
[0021] Then, CPU1 performs engine starting and an engine roll control for a control program in read-out and the main routine which is not illustrated from ROM2. Moreover, it is constituted so that timer interruption may go into CPU1 every 8ms with the timer which is not illustrated. Drawing 4 thru/or drawing 6 are the flow charts of the contents [in / in all / the timer interruption processing] of control.
[0022] In drawing 4 which shows the flow chart of the contents of control accompanying the connection condition of the external diagnostic equipment 9 in timer interruption processing, CPU1 judges first whether the external diagnostic equipment 9 is connected to ECU6 with reference to the detection signal of the connection detection switch which is not illustrated in the decision step Q1 of "external diagnostic-equipment connection ?." If the external diagnostic

equipment 9 is not connected but it is judged as "NO" in the decision step Q1, it will shift to the processing shown in drawing 5 explained below. Moreover, if the external diagnostic equipment 9 is connected and it is judged as "YES" in the decision step Q1, it will shift to the following processing step Q2 of "transmitting a processing command Request-to-Send signal", and if a processing command Request-to-Send signal is transmitted to the external diagnostic equipment 9, it will shift to the processing shown in following drawing 5 .

[0023] In drawing 5 which shows the flow chart of the program execution partial processing (activation partial processing is only called hereafter) memorized by EEPROM5 in timer interruption processing, it is first judged in the decision step R1 of "1st area read in completion flag =1?" whether the 1st area read in completion flag which shows read in completion of the 1st area of EEPROM5 is "1." In an initial state, since 0 ****** of all flags is carried out in step P1, it is judged as "NO", and it shifts to the processing shown in drawing 6 explained below.

[0024] In drawing 6 which shows the flow chart of read-out control-section processing (control-section processing is only called hereafter) of EEPROM5 in timer interruption processing, it is first judged in the processing step S1 of "EEPROM read in demand flag =1?" whether the EEPROM read in demand flag is set to "1." Here, since it is set to "1" in step P3, it is judged as "YES", and it shifts to the processing step S2 of the following "the address (N) to read-out", and is initialized in step P2, and the contents of storage of the start address of EEPROM5 (coolant temperature sensor opening / short decision value) which counted value N of an address counter shows are read through a serial bus. And it shifts to the processing step S3 of "transmitting to RAM."

[0025] In the processing step S3, the contents of storage of EEPROM5 read at step S2 are transmitted to the field to which it is assigned as a working area of RAM3. And it shifts to decision step S4 of "read in completion [of the 1st area] ?" of a degree, and the value and the counter value N which are set up as the last address of the 1st area of EEPROM5 are compared. At this time, by decision step S4, it is judged as "NO", and if it shifts to the processing step S5 of "N= N+1" and counted value N of an address counter is incremented, it will escape from timer interruption processing and it will carry out a return to the main routine which is not illustrated.

[0026] By [into which timer interruption goes / the processing shown in drawing 4 thru/or drawing 6 so far] being repeated every 8ms, the contents of storage of the 1st area of EEPROM5 are read from a head the single address every, and are transmitted to RAM3. And in step S5, the increment of the counted value N of an address counter is carried out, and it goes, and if it becomes equal to the value set up as the last address of the 1st area, in step S4, it will be judged as "YES", and will shift to the processing step S6 of the following "1st area read in completion flag set."

[0027] In the processing step S6, the 1st area read in completion flag which shows read in completion of the 1st area is set to "1", and it shifts to the decision step S7 of "read in completion [of the 2nd area] ?", and is compared with the value to which counted value N of an address counter is set as the last address of the 2nd area. At this time, at the decision step S7, it is judged as "NO", and if it shifts to the processing step S5 and counted value N of an address counter is incremented (counted value N becomes equal to the start address of the 2nd area at this time), it will escape from timer interruption processing and it will carry out a return to the main routine which is not illustrated.

[0028] Next, if timer interruption enters, since the read in completion flag of the 1st area is set to "1", it will be judged to be "YES" in step R1 of drawing 5 . And if it shifts to the decision step R2 of "external diagnostic-equipment connection ?", it will be judged whether the external

diagnostic equipment 9 is connected to ECU6 (are special requirements materialized or not?). Here, supposing the external diagnostic equipment 9 is connected, in the decision step R2, it will be judged as "YES", and it will be judged whether it shifted to the decision step R3 of "processing command receiving [from external diagnostic equipment] ?" of a degree, and the processing command was received from the external diagnostic equipment 9.

[0029] In the decision step R3, if a processing command is not received from the external diagnostic equipment 9 but it is judged as "NO", it will escape from the activation partial processing shown in drawing 5 , and will shift to the control-section processing shown in drawing 6 . In the decision step R3, if the processing command is received from the external diagnostic equipment 9 and it is judged as "YES", it will shift to the following decision step R4 of "whether a processing command is 1", and the contents of the processing command from the external diagnostic equipment 9 will judge "1" and no ("0"). In this case, the contents "1" of the processing command show the activation need for the contents of storage of the 2nd area, and the contents "0" show activation needlessness conversely. If it is judged as "YES" at this decision step R4, it will be judged whether the 2nd area read in completion flag which shifts to the decision step R5 of "2nd area read in completion flag =1?" of a degree, and shows read in completion of the 2nd area of EEPROM5 is set to "1." At this time, since the 2nd area of EEPROM5 is not read yet, it is judged to be "NO" in the decision step R5, escapes from the activation partial processing shown in drawing 5 , and shifts to the control-section processing shown in drawing 6 .

[0030] And in step S2 of drawing 6 , the contents of storage of the start address of the 2nd area of EEPROM5 which counted value N of an address counter shows at this time (head part of a coolant temperature sensor diagnostic-data output program) are read. And in the following step S3, the contents of storage are transmitted to RAM3 like the case of the 1st area.

[0031] In the following step S4, since it has completed, the read in of the 1st area judges it as "YES", and it repeats flag set actuation at step S6. In the following step S7, since it is judged as "NO" at this time, if counted value N is incremented at step S5, it will shift to the main routine which does not escape from and illustrate timer interruption processing.

[0032] By repeating the processing so far every 8ms containing timer interruption henceforth, like the case of the 1st area mentioned above, the contents of storage of the 2nd area of EEPROM5 are read from a head the single address every, and are transmitted to RAM3. And the increment of the counted value N is carried out in step S5, and it goes, and if it becomes equal to the value set up as the last address of the 2nd area, in step S7, it will be judged as "YES", and will shift to the processing step S8 of the following "2nd area read in completion flag set."

[0033] In the processing step S8, if the 2nd area read in completion flag which shows read in completion of the 2nd area is set to "1", it will shift to processing step S9 of the next "EEPROM read in demand flag reset", and if the EEPROM read in demand flag set to "1" in step P3 is set to "0" and reset, it will escape from timer interruption processing and a return will be carried out to a main routine. In the processing at the time of the timer interruption after this time, in order to judge it as "NO" in step S1, the control-section processing shown in drawing 6 after it escapes from and carries out the return of the interruption handling routine, without being carried out.

[0034] And in the next timer interruption processing, since the read in completion flag of the 2nd area is set, if it is judged as "YES" in step R4 of drawing 5 and shifts to step R5, it will be judged as "YES" here and will shift to the processing step R6 of the following "processing activation of the 1st and 2nd area."

[0035] In the processing step R6, the electric fault finding and decision value data of the 1st area

of EEPROM5 which were transmitted to RAM3 are read, and the diagnostic program is performed to the sensors 7, such as a coolant temperature sensor and an intake temperature sensor, and the actuators 8, such as an ISC bulb. And while the diagnostic data which it is as a result of [the] activation is written in RAM3 and memorized, when abnormalities are in the diagnosed part, it makes the display lamp of a panel turn on and reports abnormalities to an operator.

[0036] After troubleshooting by the diagnostic program is completed next, the diagnostic-data output program of the 2nd area of EEPROM5 transmitted to RAM3 is read, the diagnostic data memorized by RAM3 is read according to the output program, and it is outputted through a serial bus to the external diagnostic equipment 9. Then, activation partial processing of drawing 5 is ended. And the external diagnostic equipment 9 will be displayed on the display which does not illustrate the diagnostic data if a diagnostic data is given from ECU6.

[0037] Moreover, when it shifted to step R2, and the external diagnostic equipment 9 is not connected but it is judged as "NO" in step R2 after the 1st area read in completion flag was set It is not necessary to transmit a diagnostic data to the external diagnostic equipment 9, and it is judged that there is no read-out demand of the output program memorized in the 2nd area of EEPROM5. It shifts to the processing step R7 of the next "EEPROM read in demand flag reset", and an EEPROM read in demand flag is reset by "0" here. Therefore, since read-out control processing of drawing 6 is judged to be "NO" at step S1 and it escapes from processing immediately after this, read-out of the 2nd area of EEPROM5 is not performed. And if it shifts to the processing step R8 of the following "processing activation of the 1st area" and activation of the diagnostic program of the 1st area of EEPROM5 is performed like step R6, activation partial processing of drawing 5 will be ended.

[0038] Furthermore, when it shifted to step R3 and the processing command from the external diagnostic equipment 9 is not received after the 1st area read in completion flag was set, even if it judges it as "NO" at step R3 and the transfer to RAM3 of the contents of storage of the 2nd area is completed, it does not shift to step R4. Of course, after that, when a processing command is received from the external diagnostic equipment 9, it is judged as "YES" at step R3, and shifts to step R4. And when it is judged as "YES" at step R4, it shifts to steps R5 and R6.

[0039] However, when it is judged as "NO" at step R4, even if it has completed, the transfer to RAM3 of the contents of storage of the 2nd area is judged that the activation is unnecessary, and comes to shift to step R7.

[0040] The storage area of EEPROM5 which was arranged as mentioned above to the ECU6 interior which performs engine control of an automobile according to this example The 1st area which made the decision value data used for the electric fault finding usually performed after engine starting, or its program memorize, When the external diagnostic equipment 9 is connected to ECU6, it classifies and constitutes in the 2nd area which made the program for a diagnostic-data output for transmitting a diagnostic data to the external diagnostic equipment 9 memorize. CPU1 transmits the contents of storage of the 1st area to RAM3 previously, when the external diagnostic equipment 9 is connected, it transmits the contents of storage of the 2nd area to RAM3, and when not connecting, it does not perform the transfer to RAM3 -- it constituted like (it stops).

[0041] Therefore, since unlike the former read-out processing of the 2nd area of unnecessary EEPROM5 cannot be performed and the burden of read-out processing of CPU1 can be mitigated when the external diagnostic equipment 9 is not connected, the processing time can be shortened and it is also possible to assign the part of the mitigated burden to other effective

processings.
[0042] moreover, when the external diagnostic equipment 9 is connected to CPU1 and a processing command is not transmitted from the external diagnostic equipment 9 If a transfer of the contents of storage of the 1st area is completed to RAM3, a transfer of the contents of storage of the 2nd area to RAM3 will come to be started succeedingly, but activation is not carried out even if a transfer of the contents of storage of this 2nd area is completed. And the contents of storage of the 1st area and the 2nd area which CPU1 received the processing command from the external diagnostic equipment 9, and were transmitted to RAM3 when the contents of the processing command were activation need are performed.
[0043] Therefore, activation of the contents of storage of the 1st area and the 2nd area which were transmitted to RAM3 can be made to perform at the time of a request. And even if the contents of storage of the 2nd area are transmitting to RAM3, the transfer can be interrupted by making the contents of the processing command of the external diagnostic equipment 9 into activation needlessness.
[0044] This invention is not limited only to the example which described above and was indicated on the drawing, and the following deformation is possible for it. Although related with troubleshooting, the data or the program which EEPROM5 is made to memorize In EEPROM used for the code collating unit which collates whether the password code which a car antitheft device is sufficient as as long as it is related not only with this but with a car, and is memorized in the key is regular Usually, the 1st password code collated with the password code memorized in the key used well is memorized in the 1st area of EEPROM. It is used in case actuation of the code collating unit itself is inspected, and there is also an example which memorizes the 2nd password code collated with the specific password code inputted from the external device in the 2nd area. What is necessary is to make EEPROM memorize as the 1st area what has high operating frequency in short, and to make what has low operating frequency memorize as the 2nd area, and just to control not to perform read-out, if it judges that there is no read-out demand about the 2nd area (special requirements are not materialized).
[0045] Although the timer interruption period was set to 8ms, the period may be made for a long time or shorter than this. Moreover, processing at a high speed is also possible by making it perform by interruption of the short period of 2ms, only concerning the read-out control processing of EEPROM5 shown in drawing 6 . Furthermore, at the time of one interrupt processing, loop-formation processing may constitute the read-out control processing of EEPROM5 shown in drawing 6 so that the transfer to read-out and RAM3 of a multiaddress may be performed.
[0046] When the processing shown in each drawing of drawing 4 , drawing 5 , and drawing 6 as a series of timer interruption processings is constituted as one program module, respectively, the processing sequence of each of that module in timer interruption processing can be changed not only into the sequence of drawing 4 , drawing 5 , and drawing 6 but into arbitration. It can change [example / 2nd] similarly about drawing 9, drawing 10, and drawing 6 . Moreover, an object cannot be restricted to an automobile and it can apply suitably to a general car.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the electric configuration of one example of this invention
[Drawing 2] The address map of EEPROM
[Drawing 3] The flow chart which shows the contents of control of initialization processing
[Drawing 4] The flow chart accompanying the connection condition of the external diagnostic equipment in timer interruption processing
[Drawing 5] The flow chart which shows the program execution part memorized by EEPROM in timer interruption processing
[Drawing 6] The flow chart which shows the read-out control section of EEPROM in timer interruption processing
[Description of Notations]
1 -- EEPROM (non-volatile storage means), and 6 and 12 show the engine control ECU (control unit for cars), and, as for ROM (control program storage means) and 3, in CPU (control means), and 2 and 10, 9 shows external diagnostic equipment, as for RAM (working-level month storage means), and 5 and 11.

乙第4号証

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平8－177608

(43)公開日　平成８年(1996)７月12日

(51)Int.Cl.[6]	識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｆ０２Ｄ　45/00	３７６　Ｂ			
Ｂ６０Ｒ　16/02	６６０　Ｔ	8408－3D		
Ｇ０１Ｍ　17/007				
			Ｇ０１Ｍ　17/ 00　Ｚ	

審査請求　未請求　請求項の数３　ＯＬ　（全 10 頁）

(21)出願番号　特願平6－322760

(22)出願日　平成６年(1994)12月26日

(71)出願人　000004260
日本電装株式会社
愛知県刈谷市昭和町１丁目１番地

(72)発明者　沢本　哲夫
愛知県刈谷市昭和町１丁目１番地　日本電装株式会社内

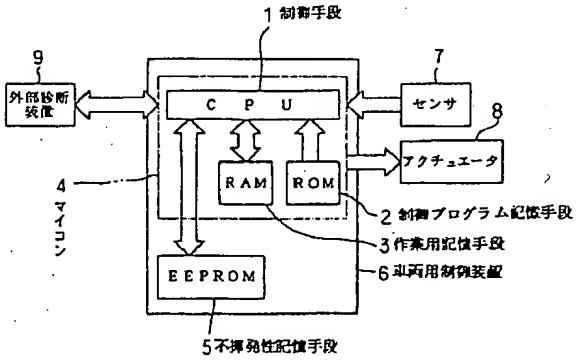
(74)代理人　弁理士　佐藤　強

(54)【発明の名称】　車両用制御装置

(57)【要約】

【目的】　シリアル通信方式不揮発性記憶手段の記憶内容の内の使用頻度の低いプログラム若しくはデータについては、特殊要件が成立したときに読出して作業用記憶手段に転送する。

【構成】　自動車のエンジン制御を行うＥＣＵ６に配置させたシリアル通信方式ＥＥＰＲＯＭ５の記憶エリアを、エンジン始動後に通常実行される故障診断プログラムや判定値データなどを記憶させた第１エリアと、ＥＣＵ６に外部診断装置９が接続された場合にのみ使用されるデータ出力用プログラムを記憶させた第２エリアとに分別して構成し、ＣＰＵ１は、第１エリアの記憶内容を先にＲＡＭ３に対して転送し、第２エリアの記憶内容は、外部診断装置９が接続されたときに読出してＲＡＭ３に転送するように構成した。



1

【特許請求の範囲】

【請求項１】　制御プログラムが記憶される制御プログラム記憶手段と、

作業時にプログラム若しくはデータが転送される作業用記憶手段と、

制御プログラム以外の補助プログラム若しくはデータが記憶されるシリアル通信方式の不揮発性記憶手段と、

制御プログラム記憶手段より読出した制御プログラムを実行すると共に、前記不揮発性記憶手段から読出した補助プログラム若しくはデータを前記作業用記憶手段に転送し、以降は必要に応じて作業用記憶手段から補助プログラムまたはデータを読出して実行する制御手段とを具備した車両用制御装置において、

前記不揮発性記憶手段は、使用頻度の高い補助プログラム若しくはデータが記憶される第１エリアと、使用頻度の低い補助プログラム若しくはデータが記憶される第２エリアとに分別されて記憶され、前記制御手段は、第１エリアの記憶内容を先に前記作業用記憶手段に転送し、特殊要件が成立しているときに第２エリアの記憶内容を作業用記憶手段に転送することを特徴とする車両用制御装置。

【請求項２】　制御手段は、特殊要件中の処理コマンドの内容に応じて第２エリアの記憶内容の転送の中止、中断若しくはその記憶内容の実行を選択するように構成されていることを特徴とする請求項１記載の車両用制御装置。

【請求項３】　不揮発性記憶手段に記憶される補助プログラム若しくはデータは、車両の故障診断に関するプログラム若しくはデータであることを特徴とする請求項１又は２記載の車両用制御装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、プログラムの実行時に記憶手段よりプログラムを読出すと、そのプログラムを高速アクセスが可能な作業用記憶手段に転送して、以降のプログラムを作業用記憶手段から読出して実行する車両用制御装置に関する。

【０００２】

【従来の技術】車両例えば自動車においては、そのエンジン制御はマイクロコンピュータを含む制御装置によって行われており、エンジンの制御プログラムはＲＯＭなどの記憶手段に記憶されている。

【０００３】また、自動車においては、制御装置の内部に補助的な記憶手段として用いられるＥＥＰＲＯＭを持つものがある。このＥＥＰＲＯＭは、配線数を少なくするためにアドレス及びデータをクロック信号に同期させて１ビットずつ送受信するシリアル通信方式のものが多く用いられている。

【０００４】

【発明が解決しようとする課題】ところでこのように、

2

シリアル通信方式ＥＥＰＲＯＭを自動車用として使用する場合には、例えばエンジンについての故障診断プログラムやその故障診断に用いる判定データなどが記憶されることが想定される。この場合は、ＥＥＰＲＯＭの読出し時間の問題からエンジンの始動時に制御プログラムが読出された後、ＥＥＰＲＯＭより故障診断プログラム及び判定データがシリアルに読出されて、アクセススピードの速いＲＡＭに転送される。そして、マイコンのＣＰＵにより、ＲＡＭに転送された故障診断プログラムが読出されて自動車の各部の診断が行われ、その結果故障発生時には、例えば運転席のパネルに表示されるなどして運転者に報知される。

【０００５】また、自動車の故障診断においては、制御装置に外部診断装置が接続されることにより、制御装置が行った故障診断結果のより詳細なデータを、外部診断装置に表示させるような場合がある。そのため、ＥＥＰＲＯＭには、外部診断装置が接続された場合に故障診断データを出力するためのデータ出力用プログラムも記憶されることも想定され、これらも、エンジン始動時に故障診断プログラムなどと共にＥＥＰＲＯＭより読出されてＲＡＭに転送されることになる。

【０００６】しかしながら、シリアル通信方式のＥＥＰＲＯＭは、前述のようにアドレス及びデータをクロック同期で１ビットずつ転送するものであり、その読出しには非常に時間を要する。また、外部診断装置が制御装置に接続される機会は定期点検時などであって希少であり、そのためのデータ出力用プログラム及びデータを毎回時間をかけてＥＥＰＲＯＭより読込んでＲＡＭに転送するのは、制御装置にとっては余分な処理負担となり、処理時間が長くなる不具合があった。

【０００７】本発明は上記課題を解決するもので、その目的は、補助記憶手段たる不揮発性記憶手段の記憶内容で、使用頻度の低い補助プログラム若しくはデータの作業用記憶手段への転送は、特殊要件が成立したときのみ行うように制御する車両用制御装置を提供するにある。

【０００８】

【課題を解決するための手段】上記目的を達成するため、請求項１記載の車両用制御装置は、制御プログラムが記憶される制御プログラム記憶手段と、作業時にプログラム若しくはデータが転送される作業用記憶手段と、制御プログラム以外の補助プログラム若しくはデータが記憶されるシリアル通信方式の不揮発性記憶手段と、制御プログラム記憶手段より読出した制御プログラムを実行すると共に、不揮発性記憶手段から読出した補助プログラム若しくはデータを作業用記憶手段に転送し、以降は必要に応じて作業用記憶手段から補助プログラムまたはデータを読出して実行する制御手段とを具備したものにおいて、不揮発性記憶手段は、使用頻度の高い補助プログラム若しくはデータが記憶される第１エリアと、使用頻度の低い補助プログラム若しくはデータが記憶され

る第２エリアとに分別されて記憶され、制御手段は、第１エリアの記憶内容を先に作業用記憶手段に転送し、特殊要件が成立しているときに第２エリアの記憶内容を作業用記憶手段に転送することを特徴とするものである。

【０００９】請求項２記載の車両用制御装置は、制御手段を、特殊要件中の処理コマンドの内容に応じて第２エリアの記憶内容の転送の中止、中断若しくはその記憶内容の実行を選択するように構成するところに特徴を有する。

【００１０】この場合、不揮発性記憶手段に記憶される補助プログラム若しくはデータは、車両の故障診断に関するプログラム若しくはデータとすると良い（請求項３）。

【００１１】

【作用】請求項１記載の車両用制御装置によれば、制御手段は、不揮発性記憶手段より使用頻度の高い第１エリアの記憶内容を先に作業用記憶手段に転送し、使用頻度の低い第２エリアの記憶内容については、特殊要件が成立しているときに読出して作業用記憶手段に転送するので、不必要な読出し及び転送処理を行うことがない。

【００１２】請求項２記載の車両用制御装置によれば、特殊要件が成立している場合でも、その特殊要件中の処理コマンドの内容に応じて第２エリアの記憶内容の作業用記憶手段への転送を中止し、または、中断し、若しくは、第２エリアの記憶内容を実行させる。

【００１３】この場合、不揮発性記憶手段に記憶される補助プログラム若しくはデータを、車両の故障診断に関するプログラム若しくはデータとすれば、低い頻度で使用される第２エリアの記憶内容は、外部より故障診断の処理に関して必要な時だけ読出されて、作業用記憶手段に転送される（請求項３）。

【００１４】

【実施例】以下本発明を車両である自動車のエンジン制御における故障診断処理に適用した場合の一実施例について図面を参照して説明する。本発明に係る部分の電気的構成を示す図１において、制御手段であるＣＰＵ１は、制御プログラム記憶手段であるＲＯＭ２及び作業用記憶手段であるＲＡＭ３にパラレルのアドレス及びデータバスライン並びに制御信号線を介して接続されている。以上がマイクロコンピュータ（以下マイコンと称す）４を構成している。

【００１５】また、マイコン４の外部には、不揮発性記憶手段であるシリアル通信方式のＥＥＰＲＯＭ５があり、ＥＥＰＲＯＭ５はＣＰＵ１と図示しないシリアルインターフェイスを介してシリアルバスで接続されている。そして、マイコン４及びＥＥＰＲＯＭ５により車両用制御装置としての図示しないエンジンを制御するエンジン制御ＥＣＵ（以下、単にＥＣＵと称す）６を構成している。

【００１６】また、ＣＰＵ１には、水温センサ、吸気温センサやスロットルセンサなどを含むセンサ７が図示しないＡ／Ｄ変換器を介して接続されており、インジェクタやアイドルスピードコントロール（ＩＳＣ）バルブなどのアクチュエータ８が、図示しない出力回路を介して接続されている。更に、ＥＣＵ６（ＣＰＵ１）には、例えば外部診断装置９が、図示しないシリアルインターフェイスを介してシリアルバスで接続が可能となっており、ＣＰＵ１は、特殊要件が成立しているか否か、即ち、外部診断装置９が接続されているか否かを、図示しない接続検知用スイッチが出力する検知信号により検知することができるようになっている。

【００１７】ＥＥＰＲＯＭ５のアドレスマップを示す図２において、アドレス領域の先頭から前半は第１エリアであり、例えば、補助データとしての水温センサのオープン／ショート判定値，吸気温センサのオープン／ショート判定値やＩＳＣバルブ異常判定値などの判定値データが格納されている。また、何れも図示はしないが、これらの判定値データを使用して故障診断を行う補助プログラムとしての水温センサ，吸気温センサやＩＳＣバルブなどの診断プログラムも格納されている。これらの第１エリアに記憶されている診断プログラム及び判定値データは、エンジンの作動時において毎回使用される使用頻度の高いものである。

【００１８】第１エリア以降は第２エリアであり、外部診断装置９に故障診断データを出力するために使用される補助プログラム，例えば、水温センサ，吸気温センサやＩＳＣバルブ診断データ出力用プログラムなどが格納されている。これらの第２エリアに記憶されている出力用プログラムは、外部診断装置９がＥＣＵ６に接続されているときのみ使用されるものであり、その使用頻度は低い。

【００１９】次に本実施例の作用を図３乃至図６をも参照して説明する。リセット解除後のイニシャライズ処理における制御内容のフローチャートを示す図３において、まず、「ＲＡＭイニシャライズ」の処理ステップＰ１において、ＣＰＵ１は、ＲＡＭ３の作業領域として使用される領域の記憶内容を０クリアする。この０クリアによって、後述する処理において、ＣＰＵ１によりソフト的にセットされて使用されるフラグも全てリセットされる。そして、次の「ＥＥＰＲＯＭ読出しアドレス（Ｎ）初期設定」の処理ステップＰ２に移行して、ＣＰＵ１のアドレスマップ上でＥＥＰＲＯＭ５に割当てられている領域の先頭アドレスＮを、アドレスカウンタに初期設定する。

【００２０】そして、「ＥＥＰＲＯＭ読込み要求フラグセット」の処理ステップＰ３に移行して、ＲＡＭ３内に設けられているＥＥＰＲＯＭ読込み要求フラグの領域に「１」を書込んでその要求フラグをセットすると、次の「割込み禁止解除」の処理ステップＰ４に移行し、電源投入時にＣＰＵ１のステータスレジスタに自動的に設定

される割込み禁止状態を解除して、図示しない次のステップに移行する。

【００２１】その後、ＣＰＵ１は、ＲＯＭ２より制御プログラムを読出し、図示しないメインルーチンにおいてエンジンの始動及び回転制御を行う。また、ＣＰＵ１には図示しないタイマによって８ｍｓ毎にタイマ割込みが入るように構成されている。図４乃至図６は、いずれもそのタイマ割込み処理における制御内容のフローチャートである。

【００２２】タイマ割込み処理における外部診断装置９の接続状態に伴う制御内容のフローチャートを示す図４では、まず、「外部診断装置接続？」の判断ステップＱ１において、ＣＰＵ１は、図示しない接続検知スイッチの検知信号を参照して、ＥＣＵ６に外部診断装置９が接続されているか否かを判断する。外部診断装置９が接続されておらず、判断ステップＱ１において「ＮＯ」と判断すると、次に説明する図５に示す処理に移行する。また、外部診断装置９が接続されており、判断ステップＱ１において「ＹＥＳ」と判断すると、次の「処理コマンド送信要求信号を送信」の処理ステップＱ２に移行して、外部診断装置９に対して処理コマンド送信要求信号を送信すると、次の図５に示す処理に移行する。

【００２３】タイマ割込み処理におけるＥＥＰＲＯＭ５に記憶されたプログラムの実行部分処理（以下、単に実行部分処理と称す）のフローチャートを示す図５において、まず、「第１エリア読込み完了フラグ＝１？」の判断ステップＲ１において、ＥＥＰＲＯＭ５の第１エリアの読込み完了を示す、第１エリア読込み完了フラグが「１」であるか否かが判断される。初期状態では、ステップＰ１においてフラグは全て０クリアされているので「ＮＯ」と判断して、次に説明する図６に示す処理に移行する。

【００２４】タイマ割込み処理におけるＥＥＰＲＯＭ５の読出し制御部分処理（以下、単に制御部分処理と称す）のフローチャートを示す図６において、まず、「ＥＥＰＲＯＭ読込み要求フラグ＝１？」の処理ステップＳ１において、ＥＥＰＲＯＭ読込み要求フラグが「１」にセットされているか否かが判断される。ここでは、ステップＰ３において「１」にセットされているので「ＹＥＳ」と判断して、次の「アドレス（Ｎ）から読出し」の処理ステップＳ２に移行して、ステップＰ２において初期化され、アドレスカウンタのカウント値Ｎが示しているＥＥＰＲＯＭ５の先頭アドレスの記憶内容（水温センサオーブン／ショート判定値）を、シリアルバスを介して読出す。そして、「ＲＡＭに転送」の処理ステップＳ３に移行する。

【００２５】処理ステップＳ３においては、ステップＳ２で読出したＥＥＰＲＯＭ５の記憶内容を、ＲＡＭ３の作業領域として割当てられている領域に転送する。そして、次の「第１エリアの読込み完了？」の判断ステップ

Ｓ４に移行して、ＥＥＰＲＯＭ５の第１エリアの最終アドレスとして設定されている値とカウンタ値Ｎとを比較する。この時点では、判断ステップＳ４では「ＮＯ」と判断して、「Ｎ＝Ｎ＋１」の処理ステップＳ５に移行してアドレスカウンタのカウント値Ｎをインクリメントすると、タイマ割込み処理を抜けて、図示しないメインルーチンにリターンする。

【００２６】ここまでの図４乃至図６に示した処理が、タイマ割込みが入る８ｍｓ毎に繰返されることにより、ＥＥＰＲＯＭ５の第１エリアの記憶内容は、先頭から１アドレスずつ読出されてＲＡＭ３に転送される。そして、アドレスカウンタのカウント値Ｎがステップ５においてインクリメントされて行き、第１エリアの最終アドレスとして設定されている値と等しくなると、ステップＳ４において「ＹＥＳ」と判断して、次の「第１エリア読込み完了フラグセット」の処理ステップＳ６に移行する。

【００２７】処理ステップＳ６においては、第１エリアの読込み完了を示す、第１エリア読込み完了フラグを「１」にセットし、「第２エリアの読込み完了？」の判断ステップＳ７に移行して、アドレスカウンタのカウント値Ｎが第２エリアの最終アドレスとして設定されている値と比較される。この時点では、判断ステップＳ７では「ＮＯ」と判断して、処理ステップＳ５に移行してアドレスカウンタのカウント値Ｎをインクリメントすると（この時点で、カウント値Ｎは第２エリアの先頭アドレスに等しくなる）、タイマ割込み処理を抜けて、図示しないメインルーチンにリターンする。

【００２８】次にタイマ割込みが入ると、第１エリアの読込み完了フラグは「１」にセットされているため、図５のステップＲ１においては「ＹＥＳ」と判断する。そして、「外部診断装置接続？」の判断ステップＲ２に移行すると、外部診断装置９がＥＣＵ６に接続されているか否か（特殊要件が成立しているか否か）が判断される。ここで、外部診断装置９が接続されているとすると、判断ステップＲ２において「ＹＥＳ」と判断し、次の「外部診断装置から処理コマンド受信？」の判断ステップＲ３に移行して、外部診断装置９から処理コマンドを受信したか否かが判断される。

【００２９】判断ステップＲ３において、外部診断装置９から処理コマンドを受信しておらず「ＮＯ」と判断すると、図５に示す実行部分処理を抜けて、図６に示す制御部分処理に移行する。判断ステップＲ３において、外部診断装置９から処理コマンドを受信しており「ＹＥＳ」と判断すると、次の「処理コマンドは１か？」の判断ステップＲ４に移行して外部診断装置９からの処理コマンドの内容が「１」か否（「０」）かを判断する。この場合、処理コマンドの内容「１」は第２エリアの記憶内容の実行必要を示し、逆に、内容「０」は実行不要を示す。この判断ステップＲ４で「ＹＥＳ」と判断する

と、次の「第２エリア読込み完了フラグ＝１？」の判断ステップＲ５に移行して、ＥＥＰＲＯＭ５の第２エリアの読込み完了を示す、第２エリア読込み完了フラグが「１」にセットされているか否かが判断される。この時点では、ＥＥＰＲＯＭ５の第２エリアはまだ読込まれていないので、判断ステップＲ５において「ＮＯ」と判断して、図５に示す実行部分処理を抜けて、図６に示す制御部分処理に移行する。

【００３０】そして、図６のステップＳ２においては、この時点でアドレスカウンタのカウント値Ｎが示しているＥＥＰＲＯＭ５の第２エリアの先頭アドレスの記憶内容（水温センサ診断データ出力プログラムの先頭部分）が読出される。そして、第１エリアの場合と同様に、次のステップＳ３において、その記憶内容はＲＡＭ３に転送される。

【００３１】次のステップＳ４においては、第１エリアの読込みは完了しているので「ＹＥＳ」と判断して、ステップＳ６でのフラグセット動作を繰返す。次のステップＳ７においては、この時点では「ＮＯ」と判断するので、ステップＳ５でカウント値Ｎをインクリメントすると、タイマ割込み処理を抜けて図示しないメインルーチンに移行する。

【００３２】以降ここまでの処理は、タイマ割込みが入る８ｍｓ毎に繰返されることにより、ＥＥＰＲＯＭ５の第２エリアの記憶内容は、前述した第１エリアの場合と同様に、先頭から１アドレスずつ読出されてＲＡＭ３に転送される。そして、カウント値Ｎがステップ５においてインクリメントされて行き、第２エリアの最終アドレスとして設定されている値と等しくなると、ステップＳ７において「ＹＥＳ」と判断して、次の「第２エリア読込み完了フラグセット」の処理ステップＳ８に移行する。

【００３３】処理ステップＳ８においては、第２エリアの読込み完了を示す、第２エリア読込み完了フラグが「１」にセットされると、次の「ＥＥＰＲＯＭ読込み要求フラグリセット」の処理ステップＳ９に移行して、ステップＰ３において「１」にセットされたＥＥＰＲＯＭ読込み要求フラグを「０」にしてリセットすると、タイマ割込み処理を抜けてメインルーチンにリターンする。この時点以降のタイマ割込時の処理では、ステップＳ１において「ＮＯ」と判断するため、それ以降の図６に示す制御部分処理は行われずに割込み処理ルーチンを抜けてリターンする。

【００３４】そして、次のタイマ割込み処理では、第２エリアの読込み完了フラグがセットされているので、図５のステップＲ４において「ＹＥＳ」と判断されてステップＲ５に移行すると、ここで「ＹＥＳ」と判断して、次の「第１及び第２エリアの処理実行」の処理ステップＲ６に移行する。

【００３５】処理ステップＲ６においては、ＲＡＭ３に転送されたＥＥＰＲＯＭ５の第１エリアの故障診断プログラム及び判定値データが読出され、水温センサや吸気温センサなどのセンサ７や、ＩＳＣバルブなどのアクチュエータ８に対してその診断プログラムが実行される。そして、その実行結果である診断データは、ＲＡＭ３に書込まれて記憶されると共に、診断した部分に異常があった場合は、パネルの表示ランプを点灯させるなどして、運転者に異常の報知を行う。

【００３６】診断プログラムによる故障診断が終了すると、次に、ＲＡＭ３に転送されたＥＥＰＲＯＭ５の第２エリアの診断データ出力プログラムが読出され、その出力プログラムに従って、ＲＡＭ３に記憶された診断データが読出されて外部診断装置９に対してシリアルバスを介して出力される。すると、図５の実行部分処理を終了する。そして、外部診断装置９は、ＥＣＵ６から診断データが与えられると、その診断データを図示しない表示部などに表示させる。

【００３７】また、第１エリア読込み完了フラグがセットされた後、ステップＲ２に移行した時点で外部診断装置９が接続されておらず、ステップＲ２において「ＮＯ」と判断した場合は、外部診断装置９に対して診断データを送信する必要はなく、ＥＥＰＲＯＭ５の第２エリアに記憶された出力プログラムの読出し要求はないと判断して、次の「ＥＥＰＲＯＭ読込み要求フラグリセット」の処理ステップＲ７に移行して、ここでＥＥＰＲＯＭ読込み要求フラグは「０」にリセットされる。従って、これ以降は、図６の読出し制御処理はステップＳ１で「ＮＯ」と判断されてすぐに処理を抜けるので、ＥＥＰＲＯＭ５の第２エリアの読出しは行われない。そして、次の「第１エリアの処理実行」の処理ステップＲ８に移行して、ＥＥＰＲＯＭ５の第１エリアの診断プログラムの実行がステップＲ６と同様に行われると、図５の実行部分処理を終了する。

【００３８】更に、第１エリア読込み完了フラグがセットされた後、ステップＲ３に移行した時点で外部診断装置９からの処理コマンドを受信しなかった場合には、ステップＲ３で「ＮＯ」と判断して、第２エリアの記憶内容のＲＡＭ３への転送が完了しても、ステップＲ４へは移行しない。勿論、その後に、外部診断装置９から処理コマンドを受信した場合には、ステップＲ３で「ＹＥＳ」と判断してステップＲ４に移行する。そして、ステップＲ４で「ＹＥＳ」と判断したときにはステップＲ５及びＲ６へと移行する。

【００３９】しかしながら、ステップＲ４で「ＮＯ」と判断した場合には、第２エリアの記憶内容のＲＡＭ３への転送は完了していても、その実行は不要と判断してステップＲ７に移行するようになる。

【００４０】以上のように本実施例によれば、自動車のエンジン制御を行うＥＣＵ６内部に配置させたＥＥＰＲＯＭ５の記憶エリアを、エンジン始動後に通常実行され

る故障診断プログラムやそのプログラムに使用される判定値データなどを記憶させた第１エリアと、ＥＣＵ６に外部診断装置９が接続された場合に、外部診断装置９に対して診断データを送信するための診断データ出力用プログラムを記憶させた第２エリアとに分別して構成し、ＣＰＵ１は、第１エリアの記憶内容を先にＲＡＭ３に対して転送して、第２エリアの記憶内容は、外部診断装置９が接続されているときにはＲＡＭ３に対して転送し、接続されていないときにはＲＡＭ３に対する転送を行わない（中止する）ように構成した。

【００４１】従って、従来とは異なり、外部診断装置９が接続されていない場合は不必要なＥＥＰＲＯＭ５の第２エリアの読出し処理を行うことがなく、ＣＰＵ１の読出し処理の負担を軽減することができるので、処理時間を短縮することができ、その軽減された負担の分を、他の有効な処理に対して割当てることも可能である。

【００４２】また、ＣＰＵ１に対して外部診断装置９が接続されていた場合において、外部診断装置９から処理コマンドが送信されてこなかったときには、ＲＡＭ３に対して第１エリアの記憶内容の転送が終了すれば、引き続いてＲＡＭ３に対する第２エリアの記憶内容の転送が開始されるようになるが、この第２エリアの記憶内容の転送が終了しても実行はされない。そして、外部診断装置９からの処理コマンドをＣＰＵ１が受信し、且つ、その処理コマンドの内容が実行必要の場合には、ＲＡＭ３に転送された第１エリア及び第２エリアの記憶内容を実行する。

【００４３】従って、ＲＡＭ３に転送された第１エリア及び第２エリアの記憶内容の実行は所望の時に行わせることができる。しかも、第２エリアの記憶内容がＲＡＭ３への転送中であっても、外部診断装置９の処理コマンドの内容を実行不要とすることにより、その転送を中断することができる。

【００４４】本発明は上記しかつ図面に記載した実施例にのみ限定されるものではなく、次のような変形が可能である。ＥＥＰＲＯＭ５に記憶させるデータ若しくはプログラムを、故障診断に関するものとしたが、これに限らず、車両に関するものであれば例えば車両盗難防止装置でも良く、キー内に記憶されている暗証コードが正規なものかを照合するコード照合ユニットに使われるＥＥＰＲＯＭにおいて、通常良く使うキー内に記憶されている暗証コードと照合される第１の暗証コードをＥＥＰＲＯＭの第１エリアに記憶しておき、コード照合ユニット自体の動作を検査する際に使用され、外部装置から入力された特定暗証コードと照合される第２の暗証コードを第２エリアに記憶する実施例もある。要は、使用頻度の高いものをＥＥＰＲＯＭに第１エリアとして記憶させ、且つ、使用頻度の低いものを第２エリアとして記憶させて、第２エリアについては読出し要求が無い（特殊要件が成立していない）と判断すると読出しを行わないように制御すれば良い。

【００４５】タイマ割込み周期を８ｍｓとしたが、その周期をこれより長くまたは短くしても良い。また、図６に示したＥＥＰＲＯＭ５の読出し制御処理に関してのみ、例えば２ｍｓの短い周期の割込みで実行させることにより、高速に処理することも可能である。更に、図６に示したＥＥＰＲＯＭ５の読出し制御処理を、１回の割込み処理時にループ処理によって、複数アドレスの読出し及びＲＡＭ３への転送を行うように構成しても良い。

【００４６】一連のタイマ割込み処理として図４，図５及び図６の各図に示した処理をそれぞれ一つのプログラムモジュールとして構成した場合は、タイマ割込み処理におけるその各モジュールの処理順序は、図４，図５，図６の順序に限らず、任意に変更が可能である。第２実施例についても、図９，図１０，図６について同様に変更が可能である。また、対象を自動車に限ることはなく、車両一般に対して適宜応用することができる。

【００４７】

【発明の効果】本発明は以上説明した通りであるので、以下の効果を奏する。請求項１記載の車両用制御装置によれば、制御手段は、不揮発性記憶手段より使用頻度の高い第１エリアの記憶内容を先に作業用記憶手段に転送し、使用頻度の低い第２エリアの記憶内容については、特殊要件が成立したときに読出して作業用記憶手段に転送するので、不必要な読出し及び転送処理を行うことがなく、処理の負担を軽減することができる。

【００４８】請求項２記載の車両用制御装置によれば、特殊要件中の処理コマンドの内容に応じて、不揮発性記憶手段から作業用記憶手段に対する第２エリアの記憶内容の転送を中止し、中断し、若しくは転送された第２エリアの記憶内容を実行することを選択的に行うことができる。

【００４９】この場合、不揮発性記憶手段に記憶される補助プログラム若しくはデータを、車両の故障診断に関するプログラム若しくはデータとすれば、低い頻度で使用される第２エリアの記憶内容は、外部より故障診断の処理に関して必要な時だけ読出されて、作業用記憶手段に転送される（請求項３）。

【図面の簡単な説明】

【図１】本発明の一実施例の電気的構成を示すブロック図

【図２】ＥＥＰＲＯＭのアドレスマップ

【図３】イニシャライズ処理の制御内容を示すフローチャート

【図４】タイマ割込み処理における外部診断装置の接続状態に伴うフローチャート

【図５】タイマ割込み処理におけるＥＥＰＲＯＭに記憶されたプログラムの実行部分を示すフローチャート

【図６】タイマ割込み処理におけるＥＥＰＲＯＭの読出し制御部分を示すフローチャート

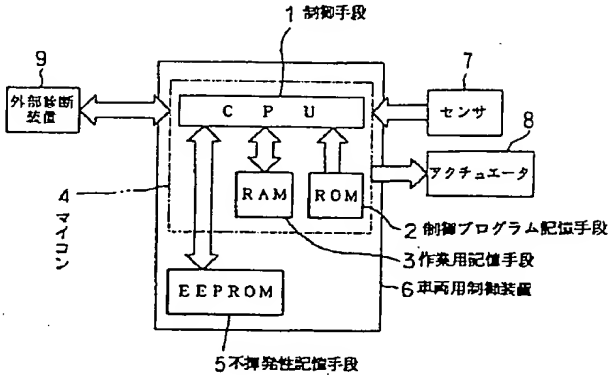
11

【符号の説明】

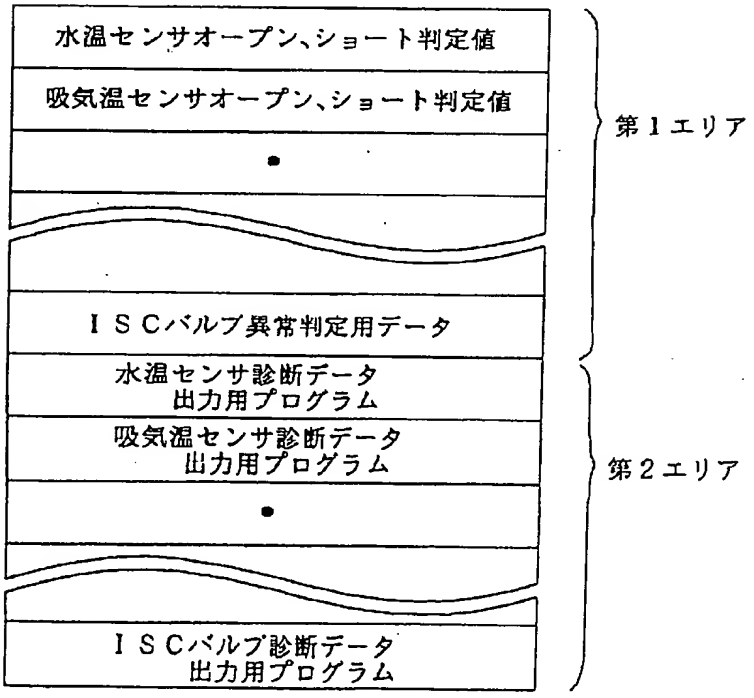
１はＣＰＵ（制御手段）、２及び１０はＲＯＭ（制御プログラム記憶手段）、３はＲＡＭ（作業用記憶手段）、＊５及び１１はＥＥＰＲＯＭ（不揮発性記憶手段）、６及び１２はエンジン制御ＥＣＵ（車両用制御装置）、９は外部診断装置を示す。

12

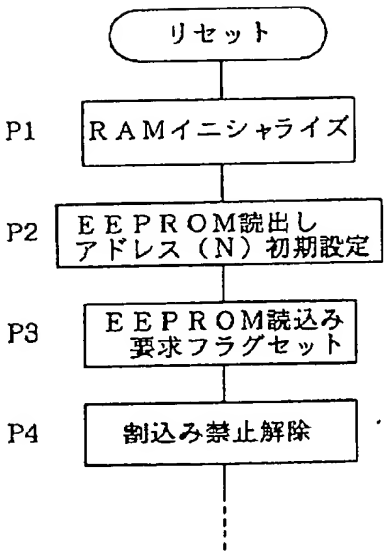
【図１】



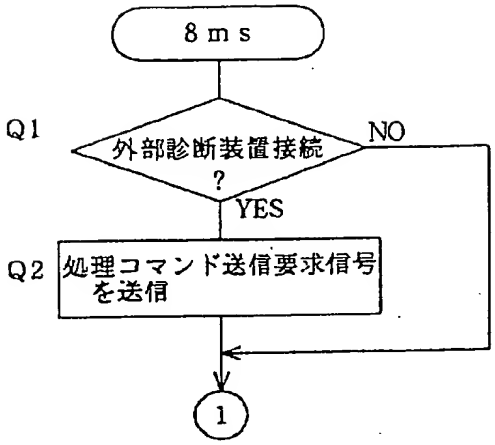
【図２】



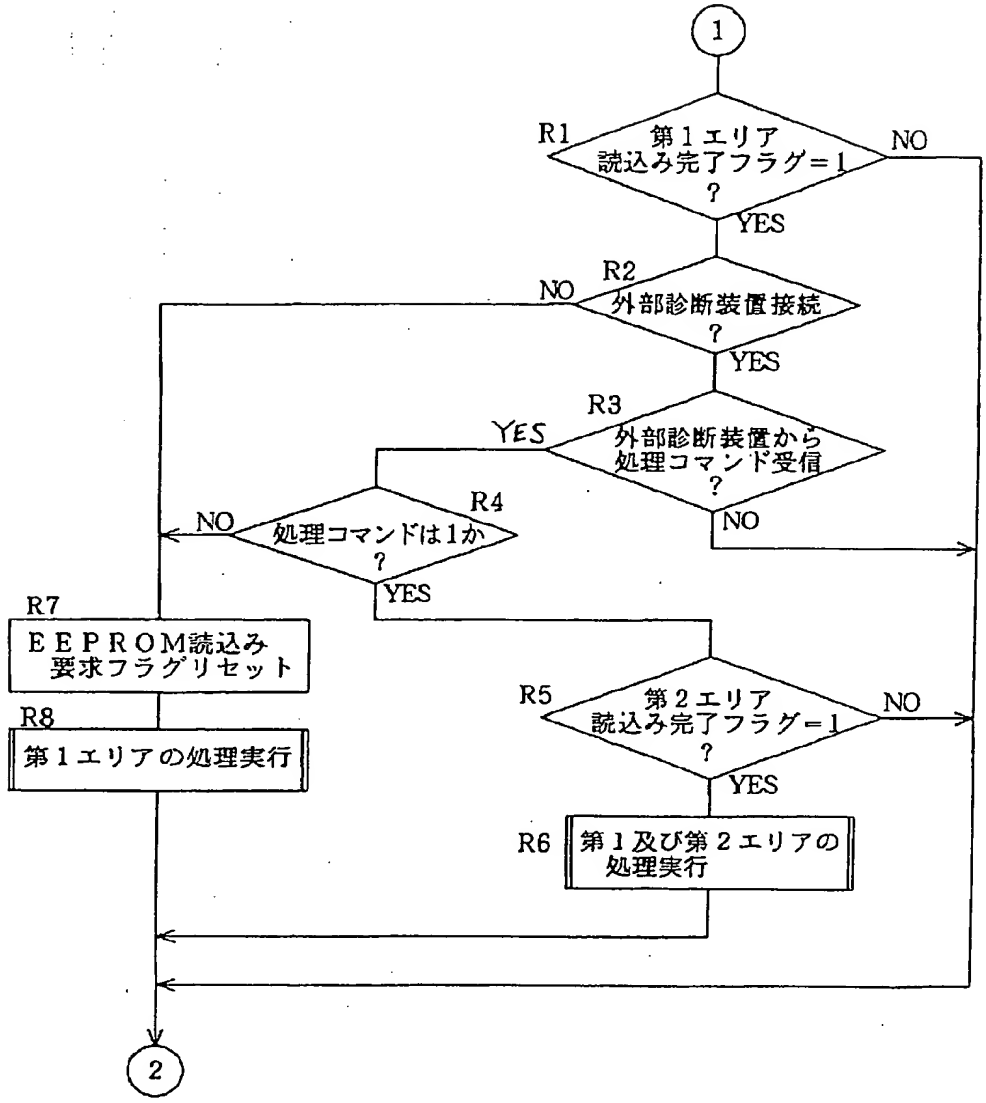
【図３】


リセット
P1
ＲＡＭイニシャライズ
P2
ＥＥＰＲＯＭ読出し
アドレス（Ｎ）初期設定
P3
ＥＥＰＲＯＭ読込み
要求フラグセット
P4
割込み禁止解除

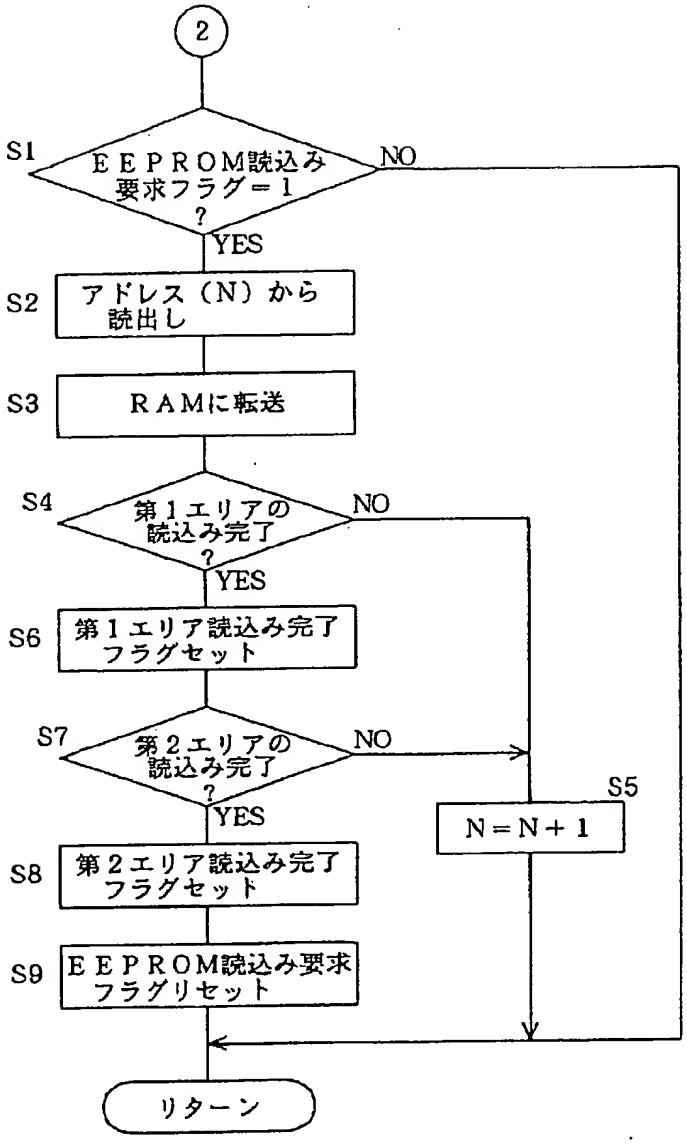
【図４】


８ｍｓ
Q1
外部診断装置接続
？
NO
YES
Q2
処理コマンド送信要求信号
を送信
1

【図５】


1
R1
第１エリア
読込み完了フラグ＝１
？
NO
YES
R2
外部診断装置接続
？
NO
YES
R3
外部診断装置から
処理コマンド受信
？
YES
NO
R4
処理コマンドは１か
？
NO
YES
R7
ＥＥＰＲＯＭ読込み
要求フラグリセット
R8
第１エリアの処理実行
R5
第２エリア
読込み完了フラグ＝１
？
NO
YES
R6
第１及び第２エリアの
処理実行
2

〔図６〕


2
S1
ＥＥＰＲＯＭ読込み要求フラグ＝１ ?
NO
YES
S2
アドレス（Ｎ）から読出し
S3
ＲＡＭに転送
S4
第１エリアの読込み完了 ?
NO
YES
S6
第１エリア読込み完了フラグセット
S7
第２エリアの読込み完了 ?
NO
YES
S5
Ｎ＝Ｎ＋１
S8
第２エリア読込み完了フラグセット
S9
ＥＥＰＲＯＭ読込み要求フラグリセット
リターン